

**IN THE UNITED STATES  
PATENT AND TRADEMARK OFFICE**

**Patent Application**

Inventors: Mary L. Mandich  
William D. Reents

Case No.: 6-7

Serial No.: UNKNOWN

Group Art Unit: UNKNOWN

Filing Date: July 24, 2001

Examiner: UNKNOWN

Title: PROCESS FOR FABRICATING OPTICAL FIBER

THE COMMISSIONER OF PATENTS AND TRADEMARKS  
WASHINGTON, D. C. 20231

Dear Sir:

**PRELIMINARY AMENDMENT**

Prior to examination, please amend the application, as follows:

**IN THE CLAIMS:**

Please cancel claim 64, and add new claims 65-76, as follows:

65. A process for preparing optical fiber, comprising the step of:  
drawing fiber from a preform comprising a sol-gel silica tube, the  
tube formed by a process including the steps of, prior to sintering the  
tube:

providing a silica dispersion,  
forming from the dispersion a gelled tube comprising water,  
hydroxyl groups, and refractory metal oxide particles,

heating the entire tube to a temperature ranging from 400 to  
800°C and,

while the tube is at the temperature, treating the tube with a  
gaseous mixture comprising one or more non-oxygenated sulfur halides,  
the treatment performed for a time period that provides sufficient

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diffusion of the one or more sulfur halides into the body such that at least one effect selected from the group consisting of reducing the concentration of water and hydroxyl groups in the tube, reducing the size of at least a portion of refractory metal oxide particles in the tube, and reducing the concentration of refractory metal oxide particles in the tube, is achieved.

66. The process of claim 65, wherein the temperature of treatment ranges from 600 to 700°C.

67. The process of claim 65, wherein the time period is at least two hours.

68. The process of claim 65, wherein the one or more sulfur halides comprises one or more sulfur chlorides.

69. The process of claim 68, wherein the one or more sulfur chlorides comprise at least one compound selected from the group consisting of sulfur monochloride and sulfur dichloride.

70. The process of claim 65, wherein the treatment reduces the size of at least a portion of refractory metal oxide particles in the tube, reduces the concentration of refractory metal oxide particles in the tube, or both reduces the size of at least a portion of refractory metal oxide particles in the body and reduces the concentration of refractory metal oxide particles in the tube.

71. The process of claim 65, wherein the treatment reduces the concentration of water and hydroxyl groups in the body.

72. The process of claim 68, wherein the gaseous mixture comprises about 6 to about 7 vol.% of the one or more sulfur chlorides.

73. The process of claim 65, wherein the tube is subjected to a treatment with chlorine gas prior to the treatment with the one or more sulfur halides, wherein the chlorine gas treatment performs at least one action selected from the group consisting of reducing the concentration of water and hydroxyl groups in the tube, reducing the size of at least a portion of chromia particles in the tube, and reducing the concentration of chromia particles in the tube.

74. The process of claim 73, wherein the chlorine treatment reduces the size of at least a portion of chromia particles in the body, reduces the concentration of chromia particles in the body, or both reduces the size of at least a portion of chromia particles in the body and reduces the concentration of chromia particles in the body.

75. The process of claim 65, wherein the tube is an overlapping tube or a substrate tube.

#### Remarks

#### Introduction

The present application is a continuation application of serial no. 09/109827. The new claims added above reflect the latest version of the following claims from 09/109827:

<u>Present application</u>	<u>Serial No. 09/109827</u>
65	52
66	53
67	54
68	63
69	55
70	56
71	57
72	58
73	59
74	60
75	62

In the parent application, claim 64 was put into independent form, and all other claims were cancelled. The subject matter of those cancelled claims is being pursued in the present application.

#### Prior Art Rejections in Parent Application

Claim 65 recites a process involving steps of heating a gelled tube to a temperature ranging from 400 to 800°C and, while the tube is at the temperature, treating the tube with a gaseous mixture comprising one or more non-oxygenated sulfur halides. The treatment is performed for a time period that provides sufficient diffusion of the one or more sulfur halides into the body such that the concentration of water and hydroxyl groups in the tube is reduced and/or the size of at least a portion of refractory metal oxide particles in the tube is reduced and/or the concentration of refractory metal oxide particles in the tube is reduced.

It is believed that the only rejection from the parent application relevant to independent claim 65 and dependent claims 66 to 75 is the 35 U.S.C. § 103(a) rejection of certain claims over U.S. Patent No. 5,356,447 to Bhandarkar ("Bhandarkar") in view of U.S. Patent No. 4,264,347 to Shintani et al. ("Shintani"). These references do not render the invention of claim 65 obvious, for the following reasons.

A. Use of the Claimed Non-Oxygenated Sulfur Chloride Goes Against the Teaching of Bhandarkar

Bhandarkar indicates that the moiety  $\text{SO}^-$  is the key for effective removal of the refractory metal oxide particles. (See Col. 3, line 67 to Col. 4, line 26.) Moreover, Bhandarkar indicates that even after looking at "[r]elated halogen-containing compounds," nothing equaling the effectiveness of  $\text{SOCl}_2$  (thionyl chloride) was found. (Col. 4, lines 6-11.) Even if one skilled in the art would have been motivated to do further experimentation, the only suggested direction for such experimentation would have been to explore other compounds containing the  $\text{SO}^-$  moiety. Using a non-oxygenated sulfur halide compound, as recited in present claim 65, would have gone against the teachings of Bhandarkar, and is therefore evidence of patentability. As noted by the Federal Circuit, "[e]vidence that supports, rather than negates, patentability must be fairly considered." In re Dow Chemical, 837 F.2d 469, 5 U.S.P.Q.2d 1529, 1531-32 (Fed. Cir. 1988). See also, W.L. Gore v. Garlock, 721 F.2d 1540, 220 U.S.P.Q. 303, 312 (Fed. Cir. 1983).

B. One Skilled in the Art Would Not Have Combined Bhandarkar and Shintani in the Asserted Manner

As stated by the Federal Circuit, "[t]he mere fact that the prior art could be so modified would not have made the modification obvious unless the prior art suggested the desirability of the modification." In re Gordon, 733 F.2d 900, 902, 221 U.S.P.Q. 1125, 1127 (Fed. Cir. 1984) (underlining added). Here, there is no indication that any technique from Shintani would have been desirable in the Bhandarkar process. To the contrary, one skilled in the art would not expect success in making such a modification of Bhandarkar, for at least three reasons.

(1) Bhandarkar states that effective particle removal requires that essentially no oxygen be present, e.g., less than 1 ppm (Col. 3, lines 55-

63). By contrast, Shintani relies on oxygen - the treating gas is flowed with oxygen between the tube and the rod (see, e.g., Col. 2, lines 62-65). In fact, Shintani uses large amounts of oxygen, e.g., 0.1 to 200 parts treating gas to 100 parts oxygen, more preferably 1 to 50 parts treating gas to 100 parts oxygen (Col. 7, lines 44-50). There would have been no motivation, and no expectation of success, in combining a process that seeks to exclude oxygen with a process that needs a high concentration of oxygen.

(2) Bhandarkar states that porosity, i.e., an unsintered body, is essential to removal of the unwanted oxide particles (Col. 4, lines 53-56). By contrast, the treatment of Shintani is not performed until after sintering, i.e., Shintani treats a consolidated, non-porous glass body. For example, the HF treatment step of Shintani, which is performed prior to treatment with its treating gas, would destroy the porous glass body of Bhandarkar, yet contributes to the success of the Shintani process. (See ¶ 8 of the attached copy of the Mandich/Reents Declaration submitted in the parent application.) There would have been no motivation to combine a process that treats a porous glass body (and which needs that porosity to be successful) with a process that treats a consolidated glass body. Nor could there have been any reasonable expectation of success in combining references intended for such differing uses - i.e., one could not have expected the compounds and techniques of one to translate into success in the other.

(3) Bhandarkar relates to a process for removing particles throughout a body - hence the need for the porosity. By contrast, Shintani only describes a surface treatment, e.g., repeatedly referring to the treating agent as a "glass surface treating agent" and discussing the process as involving a "surface treatment" or a "surface-treated" rod and tube. (See, e.g., Col. 2, lines 62-63 and 66; Col. 3, lines 5 and 25; Col. 4, lines 24-26.) There would have been no motivation to combine a process for treating the entirety of a porous body to remove oxide particles with a

process for surface-treating a consolidated, non-porous body to remove surface defects.

The Examiner disputed, in prosecution of the parent application, that Shintani and Bhandarkar were being combined, and stated that Shintani is merely cited as showing a known reactant for cleaning glass bodies. However, the fact that Bhandarkar could be modified to use a cleaning agent of Shintani does not make the modification obvious unless cited art suggested the desirability of the modification. See In re Gordon, supra. Thus, there must be some motivation to make the asserted modification.

As noted above, the materials of Shintani are intended for use with oxygen, to clean only the surfaces of sintered glass bodies, whereas Bhandarkar is intended for use without oxygen, to clean the entirety of porous bodies. There is nothing in either reference that the Examiner has pointed to that would suggest any desirability in combining any aspects of these differing references, and certainly nothing to suggest that one particular reactant of Shintani would be particularly suitable in Bhandarkar.

C. Even a Combination of the References Would Not Have Led to the Claimed Invention

Even if one skilled in the art were motivated to combine Bhandarkar and Shintani, the combination would not have led to applicants' claimed invention.

As mentioned above, Bhandarkar indicates that the moiety  $\text{SO}^-$  is the key for effective removal of the refractory metal oxide particles. (See Col. 3, line 67 to Col. 4, line 6.) Thus, if one skilled in the art was motivated to look to other compounds, the guidelines of Bhandarkar would have led primarily if not exclusively to exploration of compounds containing the  $\text{SO}^-$  moiety.

And Shintani would not have suggested otherwise. In fact, Shintani would have readily provided a skilled artisan with a list of SO-containing compounds for exactly such exploration. Specifically, at Col. 7, lines 16 to 43, Shintani lists over 70 specific surface treating agents, including "SO<sub>2</sub> and like sulfur compounds, SOF<sub>2</sub>, SOCl<sub>2</sub>, SOBr<sub>2</sub>, SO<sub>2</sub>F<sub>2</sub>, SO<sub>2</sub>Cl<sub>2</sub>, CO<sub>2</sub>(OH)F, S<sub>2</sub>O<sub>5</sub>Cl<sub>2</sub>, SO<sub>2</sub>(OH)Cl, SO(OH)F and like sulfur oxyhalides." Thus, one skilled in the art would have had plenty of oxygenated sulfur agents to use with the technique of Bhandarkar.

With Bhandarkar's clear statement of the importance of the SO<sup>-</sup> group, one skilled in the art looking from Bhandarkar to Shintani would have been drawn to similar oxygenated sulfur compounds. Nothing in Shintani or in Bhandarkar would have suggested that one ignore these oxygenated sulfur compounds, and instead focus solely on the 8 sulfur halide compounds, to the exclusion of 60-some other compounds. At most, it might have been obvious to try some of the non-oxygenated compounds found in Col. 7 of Shintani, but such a suggestion to merely try does not meet the standard for obviousness.

The Examiner stated in the parent application that the rejection is not an obvious-to-try rejection, since it is the mere substitution of one allegedly known cleaning halide material for another. This position, however, brushes aside the context in which the materials are used, which is wholly different in the two references. There can be found no motivation to focus in on the sulfur halides in the over 70 compounds of Shintani, without the benefit of hindsight.

For these reasons, the cited references would not have rendered claim 65, or its dependent claims, obvious.

In view of the amendments and remarks above, applicants respectfully request consideration of the application, and allowance of all claims.



If there are any additional fees related to this Amendment, such fees should be charged to Deposit Account No. 12-2325.

Respectfully submitted,

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Attachment:  
Copy of Declaration of Mary Mandich and William Reents Submitted in  
U.S.S.N. 09/109,827